

Wernicke-Korsakoff Syndrome

Wernicke-Korsakoff (WK) syndrome is a serious brain condition that is usually, but not exclusively, associated with chronic alcohol misuse and severe alcohol use disorder (AUD). The prevalence of WK syndrome across populations is not well established, and researchers estimate that it may remain undiagnosed in approximately 80 percent of patients.^{1,2,3}

What Causes WK Syndrome?

WK syndrome involves two different brain disorders that often occur together: Wernicke's disease and Korsakoff's psychosis. They result from brain damage associated with AUD, combined with vitamin B1 (thiamine) deficiency. In people with severe AUD, poor nutrition decreases the ability of the gut to absorb thiamine from food and, therefore, increases the chance of developing WK syndrome. Without treatment, WK syndrome can be disabling, produce permanent memory loss, and be life-threatening.^{1,2}

What Are the Symptoms?

In WK syndrome, damage occurs in a variety of brain regions, most notably the thalamus, hippocampus, hypothalamus, and cerebellum. These areas contribute to a wide range of functions such as vision, movement, language, sleep, memory, and motivation.^{1,2,3}

Symptoms of Wernicke's disease include:

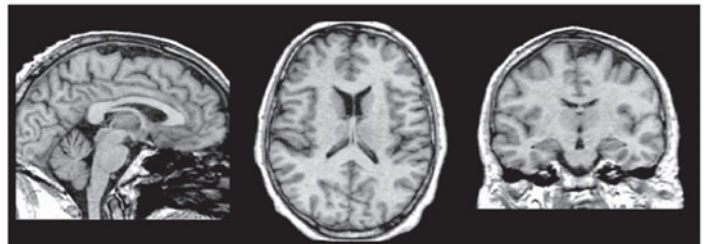
- » Confusion
- » Lack of energy, hypothermia, low blood pressure, or coma
- » Lack of muscle coordination that can affect posture and balance and can lead to tremors (i.e., involuntary movements in one or more parts of the body)
- » Vision problems such as abnormal eye movements (e.g., back and forth movements called nystagmus), double vision, misaligned or crossed eyes, and eyelid drooping

Although some symptoms of Wernicke's disease such as muscle and vision problems are reversible with prompt thiamine treatment, other symptoms may respond more slowly or may not be completely reversible. Without prompt treatment, Wernicke's disease can progress to Korsakoff's psychosis, which is not reversible.²

Symptoms of Korsakoff's psychosis include those listed above, as well as:

- » Potentially severe, irreversible memory impairments, including problems forming new memories (called anterograde amnesia) and recalling memories²
- » Making up inaccurate stories about events (i.e., confabulation) or remembering events incorrectly
- » Experiencing hallucinations (i.e., seeing or hearing things that are not really there)
- » Repetitious speech and actions^{1,2}

GRADED BRAIN-VOLUME DEFICITS IN
WERNICKE-KORSAKOFF SYNDROME
(T1-Weighted MRI scans)



A 63-year old healthy control male



A 63-year old man with Wernicke-Korsakoff syndrome

Magnetic resonance imaging (MRI) scans of a healthy male (top) compared to a male of the same age with WK syndrome (bottom). The WK brain has less brain volume and larger cavities within the brain (called ventricles).

Credit: Adapted from a figure by A. Pfefferbaum, SRI International.

- » Problems with decision-making as well as planning, organizing, and completing tasks²
- » Lack of motivation and emotional apathy²

How Is WK Syndrome Diagnosed?

WK syndrome is clinically diagnosed based on a patient's history and the presence of the above-mentioned symptoms. When clinicians identify possible cases of WK syndrome, they may be able to confirm the diagnosis through magnetic resonance imaging (MRI) scans of the brain. It is noteworthy that WK syndrome may result from other conditions that involve malnutrition and B1 deficiency, such as cancer, AIDS, excessive vomiting (often associated with pregnancy), anorexia nervosa, hemodialysis, and gastrointestinal or bariatric surgery.¹ However, these cases are far less prevalent than those associated with severe AUD.

How Is WK Syndrome Treated?

If you are concerned about someone with WK syndrome, talk to your primary care physician or a specialist—such as an internist, psychiatrist, [addiction psychiatrist](#), [addiction medicine physician](#), or [neurologist](#).

Early symptoms of Wernicke's disease can be reversed if detected and treated promptly and completely; therefore, Wernicke's disease should be considered a medical emergency. Doctors treat Wernicke's disease with intravenous administration of vitamin B1 and glucose. Treatment may also consist of addressing co-occurring symptoms in the short term.¹

Without adequate treatment, Wernicke's disease can progress into Korsakoff's psychosis. In Korsakoff's psychosis, severe memory loss and other damage could become permanent. Treatments for Korsakoff's psychosis include intravenous vitamin B1 replacement therapy and oral supplements for several weeks, as well as proper nutrition, hydration, and other medications to manage specific symptoms. Aside from B1 therapy in the short term, there is no one optimal treatment—treatment often varies depending on symptoms, severity, and other co-occurring deficits such as psychosis or other major psychiatric disorders. Memory rehabilitation therapies—similar to those provided for various forms of dementia—can be effective in lessening the symptoms, but severe cases often require residential care.¹

Caution: Alcohol Withdrawal

Abstaining from alcohol use is critical to prevent and reduce additional brain damage at all stages of WK syndrome.^{1,2} Please note that when someone who has been drinking heavily for a prolonged period of time suddenly stops drinking, the body can go into a painful or even potentially life-threatening process of withdrawal. Individuals should seek medical help to plan a safe recovery.

For more information about how alcohol affects the brain, please visit [Alcohol and the Brain](#).
For more information about available evidence-based treatments for AUD, please visit the [NIAAA Alcohol Treatment Navigator](#).

¹ Oscar-Berman, M.; and Maleki, N. Alcohol dementia, Wernicke's encephalopathy, and Korsakoff's syndrome. In: Alosco, M.L.; and Stern, R.A., eds. *The Oxford Handbook of Adult Cognitive Disorders*. Oxford University Press, 2018. <https://doi.org/10.1093/oxfordhb/9780190664121.013.33>

² Koob, G.F.; Arends, M.A.; McCracken, M.; and Le Moal, M. Chapter 5.4.4. Neurological disorders. *Neurobiology of Addiction*. Vol. 3. Academic Press, 2021.

³ Oscar-Berman, M. Function and dysfunction of prefrontal brain circuitry in alcoholic Korsakoff's syndrome. *Neuropsychol Rev* 22:154–169, 2012. <https://doi.org/10.1007/s11065-012-9198-x>.



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